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**Article**

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## Short-term impact of COVID-19 on financial system in a dollarized economy

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### ABSTRACT

This paper analyzes the short-term impact of the lockdown policies implemented to stop the spread of the COVID-19 on the Ecuadorian financial system. We use a regression discontinuity in time (RDiT) design jointly with official data. Results show an overall decrease in total deposits (-3.4%) as well as in credits targeted to private sector (-0.60%). In addition, we find heterogeneous results across the different types of credits and deposits being the most affected those related to public institutions.

**Keywords:** COVID-19, lockdown, financial system, regression discontinuity, Ecuador.

**JEL classification:** G21; G51; H12.

**MSC2010:** 91B82; 91B84.

# Impacto a corto plazo del COVID-19 en el sistema financiero en una economía dolarizada

## RESUMEN

Este trabajo analiza el impacto a corto plazo de las políticas de bloqueo implementadas para frenar la propagación del COVID-19 en el sistema financiero ecuatoriano. Se utiliza un diseño de regresión discontinua en el tiempo (RDiT) junto con datos oficiales. Los resultados muestran una disminución generalizada de los depósitos totales (-3.4%) así como de los créditos dirigidos al sector privado (-0.60%). Además, se encuentran resultados heterogéneos entre los diferentes tipos de créditos y depósitos siendo los más afectados los relacionados con las instituciones públicas.

**Palabras clave:** COVID-19, Bloqueo, sistema financiero, Regresión Discontinua, Ecuador

**Clasificación JEL:** G21; G51; H12.

**MSC2010:** 91B82; 91B84.



## 1. Introduction

The arrival of COVID-19 pandemic caused a general crisis in the world economy. Goodell (2020) states that, in the context of the economic crisis, the banking system, due to late payment of loans and the possibility of a bank run, is vulnerable. On the other hand, Giese and Haldane (2020) assure that banking could become the solution. After past crises, the reconstruction of Basel III established regulatory minimums of a prudential nature that cover liquidity and leverage (Basel III is an internationally agreed set of measures developed by the Basel Committee on Banking Supervision in response to the financial crisis of 2007-09. The measures aim to strengthen the regulation, supervision and risk management of banks.). The establishment of a “cushion” makes it possible to avoid a financial crisis during a time of economic stress by satisfying the needs of the financial system. In other words, over the years, the financial system has been reformed in order to withstand future crises. However, COVID-19 is considered the strongest crisis since 1924. The problem caused by COVID-19 arises because, in order to stop the spread of the virus, a state of global emergency was declared, urging nations to close their borders and establish mobility restriction on their territory. Atalan (2020) mentions that around 90% of the world applied social isolation, and this generated destruction in the economy. As a result, consumption was reduced, production fell, unemployment increased, and the supply chain was affected, all this disturbed the financial markets due to the need for financing from the private sector, or even due to the risk and fragility that is looming faced with an economic contraction of this magnitude (Sarkis, 2020).

However, financial systems, in general, have reacted quite well to this shock. Giese and Haldane (2020) affirm that, although there has been a default on payments to banks, their resistance is greater, avoiding a collapse similar to that of the 2008 crisis, rejecting the magnitude of the damage of COVID-19 mentioned by Goodell (2020). These authors affirm that a greater resilience and availability of credit can be seen on the part of borrowers and that the pandemic has increased the request for loans from firms and households, being a support, together with the government, for the economy in general. In developing countries, the story may be a bit different as higher deposit turnover is generated, leading to higher withdrawals. While, Giese and Haldane (2020) analyze the relevance of bank loans in generating liquidity, Goodell refers to the people who are at the bottom of the pyramid, as instruments that have no means to guarantee liquidity in the economy.

In this path, banks in developing economies should follow a countercyclical policy in granting credit; nevertheless, there is a reluctance of banks to grant loans during a crisis, affecting the business sector (Bastos & Pindado, 2013) reducing liquidity (Kremp & Sevestre, 2013). This could aggravate the economic and social problems of the countries since in times of crisis, companies faced with a credit restriction, withdrawal of deposits and that have a large number of accounts receivable postpone their payments to suppliers to avoid the risk illiquidity, that is, they delay payment by spreading credit contagion in the supply chain (Bastos & Pindado, 2013).

In this paper, we therefore analyze the short-term the impact of the lockdown policies implemented to stop the spread of the COVID-19 on Ecuadorian financial system. Ecuador is a small open economy dollarized since 2000 and with strong bank regulatory system since the dollarization. The rapid spread of the virus in Ecuador and the official declaration of the WHO as a pandemic led the Government of this country to take confinement (lockdown) measures that were decreed and implemented on March 16, 2020. This lockdown decree restricted the mobility and face-to-face work hours in non-essential economic sectors (Camino-Mogro, 2020). For this, we exploit the exogenous variation coming from the COVID-19 pandemic and its lockdown policy in Ecuador and perform a regression discontinuity in time (RDiT) design as my identification strategy. Furthermore, we analyze the impact of the lockdown policy on several outcomes of banks deposits and credits. we use an official data set between December, 2019 to June, 2020 of all types of deposits and credits in Ecuador.

The paper contributes to the growing literature on crisis, shocks, business cycle and impact on deposits and credits in developing economies. In particular, the contribution relies on how the COVID-19 pandemic lockdown policy could affect financial system in a strong bank regulated system for the

first time (to our knowledge). Studies on the impact of the COVID-19 pandemic on financial system focused on stock markets (see, for example: Albulescu, 2021; Engelhardt, Krause, Neukirchen, & Posch, 2020; Zaremba, Kizys, Aharon, & Demir, 2020; Zhang, Hu, & Ji, 2020). However, in this paper we exploit the exogenous characteristic of the lockdown policy induced by the COVID-19 to assess its impact on financial system. This analysis is novelty since is the first that uses a RDiT design which is an impact evaluation policy strategy.

The reminder of the paper is organized as follows. In Section 2, the data and empirical strategy is shown. Section 3 presents the main results. Finally, Section 4 concludes.

## 2. Data and empirical strategy

To analyze the impact of COVID-19 lockdown policy on Ecuadorian financial system, we use weekly data for deposits and credits over the period from December 2019 to June 2020 (obviously, having daily data would be the best; however, this is the most desegregated period that exists in Ecuador). This period of window allows us to employ a regression discontinuity in time (RDiT) design using the president's order effective lockdown on March 16, 2020. This gives 15 weeks on each side of the cutoff date on the base line model. We use this time horizon because it allows us to get a balance pre-post period of the president's order effective lockdown, but also we do not use a large time horizon (post periods) because after June 2020 the lockdown was relaxed in many provinces and this issue could disturb the impact of the lockdown on our outcomes of interest.

The database is publicly available at the Banco Central del Ecuador (BCE). In particular, we analyze six different outcomes within each category: for deposits, we use total, firm's, households, GADS (this is a level of desegregation of decentralized governments, such as municipalities, among others), fixed-term and other deposits; for credits, we use credits to private sector, central government, GADS, intern credit, credits from private banks and public banks, by week, before and after the COVID-19 lockdown in Ecuador. Finally, we use 30 weeks (observations) in the analysis. All variables are measured at national level.

To assess the direct impact of the COVID-19 lockdown on deposits and credits, we design a research strategy that exploits the completely exogenous effect of COVID-19 pandemic that induces a lockdown (and resulting cessation of activities) on March 16, 2020 in Ecuador. We rely on a regression discontinuity in time (RDiT) approach as there is high frequent data, and observe enough data points around the cutoff (Anderson, 2014; Auffhammer & Kellogg, 2011). The RDiT is a quasi-natural experimental econometric technique, but also is a special case of the classical regression discontinuity design (RDD), where time is the so-called running or forcing variable, this allow us to rigorously compare the impacts of the lockdown on deposits and credits in a time window around the lockdown date.

Similar to Barnes, Beland, Huh, and Kim (2020) and Dang and Trinh (2021) where the running variable is the time of COVID-19 lockdown, but assessing other outcomes; the empirical strategy is to leverage the sharp discontinuities of deposits and credits when the lockdown goes into effect. For this, Cattaneo, Idrobo, and Titiunik (2020) argues that the motivation of the RDD approach is that within a relatively narrow window of time around an event (in this case the lockdown), the unobserved factors influencing the dependent variable are likely similar so that observations before the event provide a counterfactual group that can be compared with observations after the same event. To perform this, we formally estimate the treatment effect as the outcomes variations in Ecuadorian deposits and credits around the lockdown date:

$$\tau_{RD} = \lim_{s \downarrow 0} E[y|w = 0 + \varepsilon] - \lim_{s \uparrow 0} E[y|w = 0 + \varepsilon] \quad [1]$$

where,  $w$  is the number of weeks before and after the official lockdown date. We subsequently employ an approach according to Imbens and Lemieux (2008), where one estimates the following model when adopting a RDiT approach, using March 16, 2020 as the cutoff date when the president decrees the lockdown and restriction the mobility and face-to-face work day.

$$y_w = \beta_0 + \beta_1 \text{PostLockdown}_w + \beta_2 \text{Weeks}_w + \beta_3 \text{Weeks}_w * \text{PostLockdown}_w + W_m + \varepsilon_w \quad [2]$$

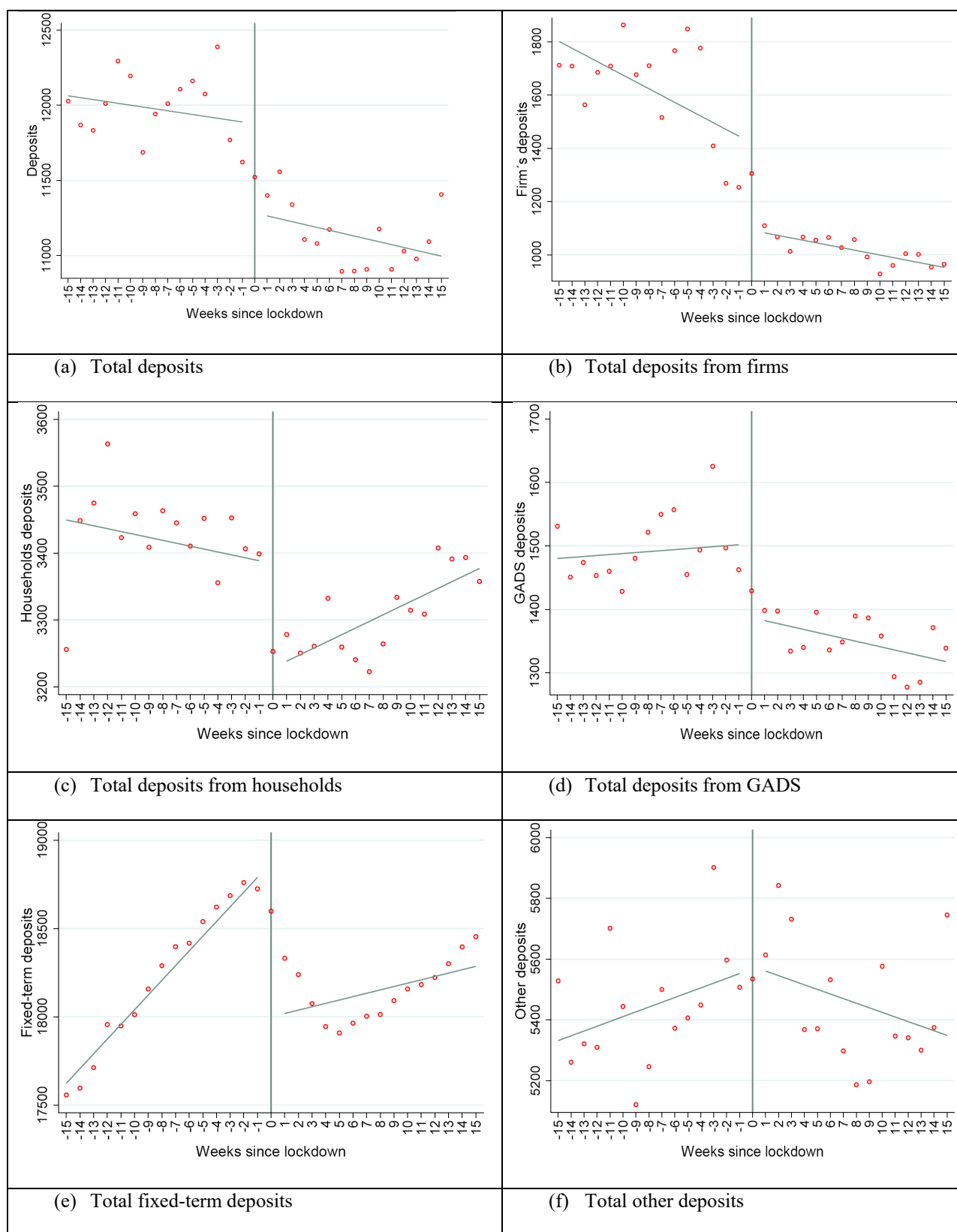
where,  $y_w$  reflects the respective outcome variable (deposits and credits) at week  $w$ . The parameter of interest is  $\beta_1$  the (local average treatment) impacts of the lockdown on  $y_w$ , for which we obtain an unbiased estimate under the RD assumption that  $s_w$  does not change discontinuously at the policy introduction (Anderson, 2014); the treatment variable is *PostLockdown* which is a dummy variable that is equal to one for all weeks after the lockdown on March 16 and zero for all preceding weeks. The running variable is *Weeks<sub>w</sub>* which represents the number of weeks since the official lockdown date took place;  $\beta_2$  is a general, linear time trend for the entire observation period. *Weeks<sub>w</sub> \* PostLockdown<sub>w</sub>* is an interaction between *Weeks<sub>w</sub>* and *PostLockdown<sub>w</sub>* that should absorb everything that may produce changes in the outcome  $y_w$  around the cutoff;  $\beta_3$  indicates a potential change in the time trend for the post-intervention period. Finally,  $W_m$  is a week-of-the-month fixed effects and  $\varepsilon_w$  is the error term. We report standard errors robust to heteroskedasticity, and we use a triangular kernel, and a linear polynomial approximation for the estimation procedure.

Before presenting the main results, we show graphical evidence of the effect of the COVID-19 lockdown on six different outcomes of deposits and credits in Ecuador during the period from December 2019 to June 2020. We run a data-deposits and credits RDiT of the number of the total amount of deposits and credits against the number of weeks around the lockdown date.

We plot in Figure 1 the results of the RDiT for six outcomes of deposits, which shows that deposits in Ecuador decrease a week after the lockdown date in Ecuador. In panel 2(a) it is shown that total deposits decrease immediately after the lockdown but it does not recovery after 15 weeks; something similar occurs with firm's deposits (panel 2(b)), GADS deposits (panel 2(d)). On the other hand, we show in panel 2(c) that households deposits decrease a week after the lockdown policy, but starts recovery immediately, this pattern is similar with fixed-term deposits (panel 2(e)); for other deposits (panel 2(f)) no clear discontinuity is seen.

Finally, in Figure 2 we plot the results of the RDiT for six outcomes of credits which shows that credits in Ecuador decreases a week after the lockdown date in Ecuador, with the exception of credits to central government (panel 3(c)) and credits from public banks (panel 3(f)). In panel 3(a) it is shown that total credits to private sector decrease immediately after the lockdown but it does not recover after 15 weeks; something similar occurs with credits from private banks (panel 3(e)); nevertheless, for credits to GADS (panel 3(d)) immediately recover after a week of the lockdown. Finally, for intern credits (panel 3(b)) no clear discontinuity is seen. Overall, the two figures show that the amount of deposits and credits in the Ecuadorian financial system decrease after the COVID-19 lockdown policy; however, it seems that the negative effect is small. This evidence is particular interesting because it suggests that the impacts of the lockdown on the outcomes analyzed here may exist only in the short-run.

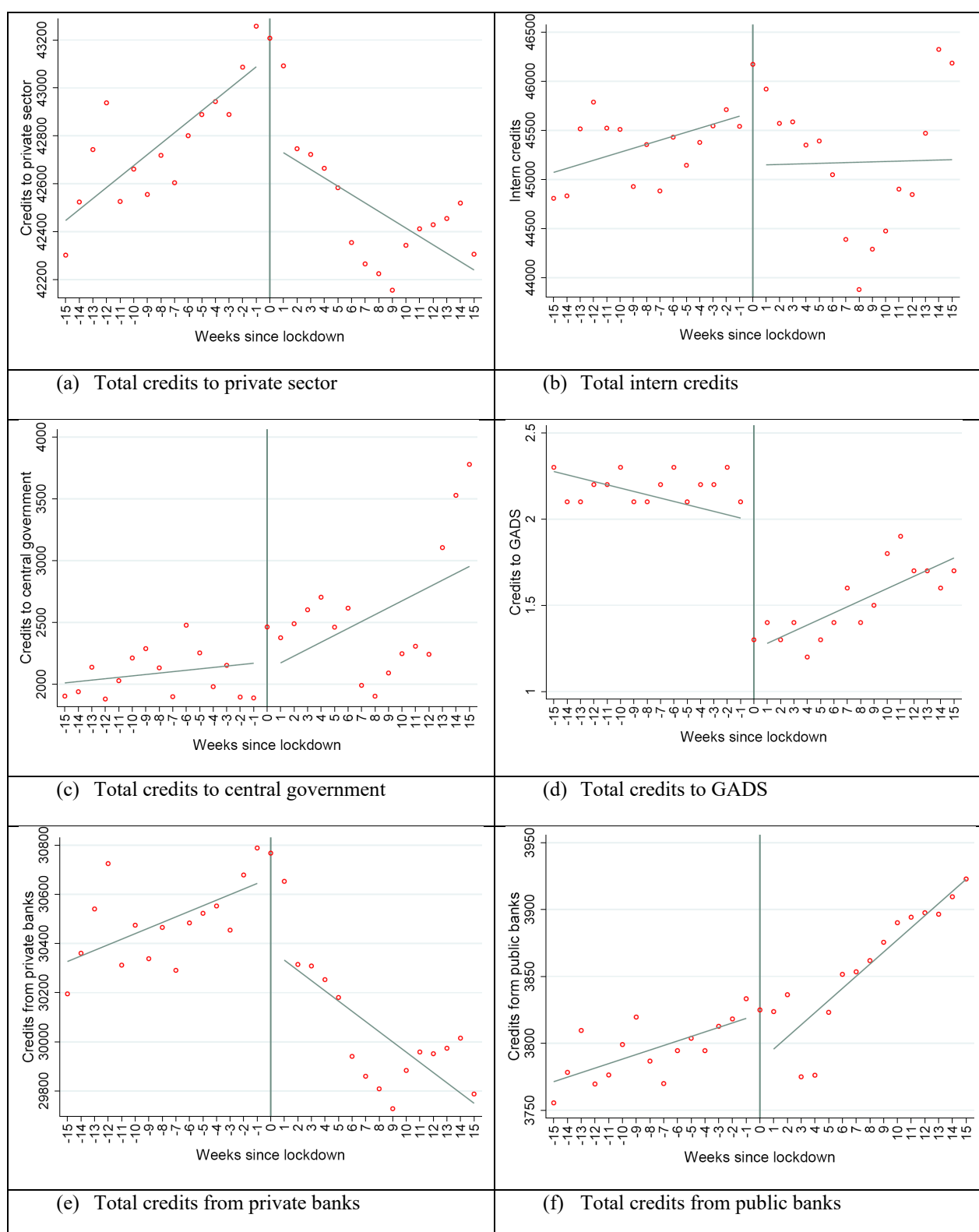
**Figure 1. Regression discontinuity in time plots for total deposits.**



Note: Panels show RDIT plots with fitted lines corresponding to Equation (2) for various types of deposits.

Source: Banco Central del Ecuador (BCE).

**Figure 2. Regression discontinuity in time plots for total credits.**



Note: Panels show RDIT plots with fitted lines corresponding to Equation (2) for various types of credits.

Source: Banco Central del Ecuador (BCE).



### 3. Main results

Table 1 shows the main results using equation (2) for six different outcomes of deposits and credits in Ecuador in a RDiT design. In Panel A, we present the mean effect of COVID-19 lockdown on six different outcomes of deposits, using a bandwidth of  $\pm 15$  weeks; this allows us to analyze the mean impact of this policy around four months of the induced lockdown. The results suggest that the COVID-19 lockdown has a strong statistically significant impact on different measures of deposits at 5 and 1 percent level, except for the category “other deposits” where we do not find any statistically significant results at standard levels. In particular, we find that the induced lockdown policy is linked to a decrease of total deposits of -3.4% ( $=(-408.122/11998.99)*100$ ) after 15 weeks of the lockdown decree. The largest mean negative impact of this policy is found in firm’s deposits (-13%) and GADS deposits (-8.69%), a plausible explanation for this may be that the mandatory confinement of March 16, 2020 immediately affected firms because many of the economic activities were not authorized to continue operating and only those declared as essential activities could continue to operate with the respective restrictions of mobility, which reduced firm sales and consequently deposits in the financial system. Additionally, many firms laid off staff which also might have led to a decrease in household mean deposits (in this case a decrease of -3.30%). Finally, fixed-term deposits had also a negative impact of -3.9% in relative terms.

In Panel B, we show the results of the mean impact of COVID-19 lockdown on six different outcomes of credits, using the same bandwidth as in the deposits estimates. We find that COVID-19 induced lockdown has a mean negative and significant impact in all the outcomes except for credits to central government, where there is a mean positive and significant impact (19.19%). The positive impact on “credit to the central government” is part of the loans received by multilateral organizations and the renegotiation of the external debt. While the mean negative impact of the lockdown on credit to GADS is again the largest (as in deposits) with a decrease of -34.75%, showing that the municipal governments could have had some type of resource needs that were not met during the first part of the pandemic, this could have happened because the pandemic was initially attended directly by the central government. Additionally, credits to the private sector and intern credit also suffered a negative impact as a result of the lockdown of 0.60% and 0.04%, respectively; this mean impact is small but significant, suggesting that, once again, the private sector has also been affected. Finally, credits from private and public banks were also negatively affected in -0.63% and 1.04% respectively, this points to that credits from the private banking sector were less affected than credits from the public banking sector (in relative terms) which is compatible with a certain vulnerability of the public financial system.

This evidence is in concordance with the literature of pandemics and the decline of financial systems that suggests that a pandemic-induced economic downturn will put pressure on banks’ loan portfolios and can lead to a large withdrawal of deposits, particularly in poor and developing countries (see, for example: Beck, 2020; Gong, Jiang, & Lu, 2021; Lagoarde-Segot & Leoni, 2013; Leoni, 2013). However, Goodell (2020) argues that another question is whether COVID-19 should be regarded as a black swan, or an unforeseeable event with extreme consequences, similar to the answer of the author, our results suggest that seems to be “no”. In specific, the results here show that the effect is smaller in credits compared to deposits, because the financial system was able to accommodate these liquidity demands due to the solvency that the banking system previously had. Li, Strahan and Zhang (2020) argue that the increase in liquidity demands was concentrated at the largest banks, who serve the largest pre crisis financial condition did.

**Table 1. Effect of COVID-19 lockdown on financial system: Bandwidth +/- 15 weeks.**

Panel A: Deposits						
	Total deposits	Firms deposits	Households deposits	GADS deposits	Fixed-term deposits	Other deposits
$PostLockdown_t = 1$	-408.122** (173.463)	-212.245*** (75.355)	-112.843** (40.644)	-130.064*** (31.228)	-710.083*** (95.327)	47.035 (138.481)
%-Change	-3.40	-13.01	-3.30	-8.69	-3.90	0.86
$Timetrend_t$	28.841* (16.573)	46.113*** (9.857)	11.756*** (4.149)	-1.033 (3.418)	-71.273*** (8.318)	-27.995** (10.972)
$Post * trend_t$	-73.273*** (22.026)	-57.542*** (10.867)	-4.222 (5.189)	-2.296 (4.431)	67.454*** (13.704)	-9.216 (18.285)
Mean before lockdown	11998.99	1630.96	3427.8	1496	18224.78	5444.25
R squared	0.833	0.850	0.765	0.806	0.853	0.471
Panel B: Credits						
	Private sector	Intern credits	Credits to C. Gov.	Credits to GADS	Credits from private banks	Credits from public banks
$PostLockdown_t = 1$	-257.601** (105.757)	19.636* (216.171)	407.929** (151.790)	-0.755*** (0.165)	-192.488* (104.570)	-39.613* (21.968)
%-Change	-0.60	-0.04	19.19	-34.75	-0.63	-1.04
$Timetrend_t$	-53.931*** (9.669)	-54.284** (25.179)	-0.393 (13.999)	0.032 (0.021)	-29.483*** (9.329)	-4.030** (1.427)
$Post * trend_t$	-9.479 (17.088)	-60.858 (44.140)	-20.043 (25.048)	0.011 (0.022)	- (16.064)	13.027*** (2.681)
Mean before lockdown	42762.56	45325.49	2072.11	2.18	30478.78	3794.78
R squared	0.835	0.545	0.352	0.826	0.850	0.675
Observations	29	29	29	29	29	29

Notes: Robust standard errors in parentheses. \* $p < 0.1$ , \*\* $p < 0.05$ , \*\*\* $p < 0.01$ .

Running variable is number of weeks from the lockdown date. All regressions include week Fixed Effects.

Source: Own elaboration.

## 4. Conclusions

There is vast research studying how financial systems are affected by economic crises; nevertheless, there is still scarce literature that analyzes the impact of pandemics on deposits and credits. In this letter, we quantify the short-term mean impact of COVID-19 lockdown on six different outcomes of deposits and credits in the Ecuadorian financial system. For this, we exploit the completely exogenous source of variation provided by the COVID-19 lockdown on the outcomes by using a regression discontinuity in time (RDiT) design.

The empirical results reveal that the COVID-19 lockdown significantly decreases deposits and credits in Ecuador. In particular firm's deposits, credits to GADS and credits from public banks are those that are more affected. However, the effect is smaller in credits compared to deposits.

Our results are of important policy relevance. First, we show that lockdown policies have detrimental effects on deposits and credits, so policies or actions that restrict economic activities could negatively affects the financial system. This is not new for Ecuador, since for many times this country has suffered the so called "Paros" (strikes) that are people manifestation that stops economic activities.

In this point, recently, in October 2019 the indigenous people did a "Paro" that took place in Quito and many important cities, this Paro had important losses for economic activities and consequently for the financial system. In this sense, the government should make efforts to guarantee minimum levels of economic activities when mass mobilizations occur. Second, to boost deposits and credits in a pandemic scenario where policies are focused on reducing mobility, the government might incentivize the use of electronic channels in the banking system. For this, it is crucial to boost financial inclusion of poor and vulnerable people. Finally, and according to our second point, the government might encourage the use of electronic money.

This research has some limitations. In specific, our results should be discussed only as a short-term effect. Additionally, the study of Ecuador is a particular case of study because it is dollarized but with low levels of financial inclusion and use of electronic channels. More analysis of different countries should be conducted to get a big picture of the impact of lockdown policies on financial systems.

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